**Individual Project due 24:00 7 October, 2012 (to be loaded onto your wiki).**

**Name:**

Project - Thin client network for a small school with computer room using sensor lighting

e.g. <http://www.clipsal.com.au/consumer/products/lighting/motion_sensors>



The project could concentrate on installing a thin client network for a small school with solar panels, gel batteries, inverter and a small network of 20 desktop PC’s which may include a server, printer and other necessary equipment. The proposed network provides service to a classroom that has fluorescent lighting. Classes operate between the hours 8.30am to 3.30pm (7.00 hours)

Assumptions:

• The existing computer network is ON 5 days per week 24 hours per day

• The existing classroom lighting is ON 5 days per week 10 hours per day – equating to 2000 hours based on 40 school weeks.

**Individual Project**

1. Negotiate with the stakeholders to establish the extent to which sustainability is to be integrated

Answer:

**Hardware**

□ renewable energy source

□ low powered hardware e.g netbooks/low power laptop

□ energy efficient architecture

Summary: My Individual Project uses ….

**Software**

□ energy management software

**Printing**

□ local – Research a green Printer

□ online

□ to Pdf/wiki – provide and publish documentation to advocate the use of pdf and wiki use

2. Advise short term technology solutions to achieve reduction of power consumption

Answer:

* Implement and promote policies to turn off devices such as monitors, computers and lighting.
* Replace all incandescent and fluorescent with energy efficient CFL bulbs.
* Reduce number of light bulbs (de-lamping) in use while still adhering to AS 1680.2.3 by using high efficiency light.
* Install motion sensor switches for lighting
* Maximise use of natural light and ventilation – promote the use of daylight as much as possible. Skylights may also be installed in areas such as toilets, changing rooms, etc. Opening doors and windows to improve airflow can decrease the need for air conditioning in classrooms.
* Turn off devices or appliances that consume energy while in standby mode when not in use.
* Prevent unnecessary printing of documents. Use emails or print to PDFs and publish documents online. This saves consumables (e.g. electricity, paper, toner, diffuser, etc.) and time.

3. Identify energy usage within the scope of the ICT project and provide a detailed report

Answer:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Condition** | **1 Netbook (Asus EEE PC 700 series) watts** | **Server**  **(Intel based server)** | **Printer - Lanier GXe3350N** | **Notes** |
| OFF | 1.98 | 19 | 0 |  |
| MAX BOOT | 2.67 | 42 | 7 |  |
| IDLE | 2.47 | 42 | 2.5 |  |
| Wordprocessing | 15 | 44 |  |  |
| Spreadsheets | 15 | N/A |  |  |
| Web browsing - http://news.bbc.co.uk/2/hi/programmes/click\_online/default.stm | 16.8 | N/A |  |  |
| Low level music - http://grooveshark.com/#/s/Fall+At+Your+Feet/3KIZB0?src=5 | 16 | N/A |  |  |
| Low level video - http://www.joost.com/39w1yk49/#/?video\_info=33p1yw1t | 15.5 |  |  |  |
| Monitor | 15.2 (external monitor) | 21 | 36 |  |
| Printing | 15 |  |  |  |

**PowerPoint Presentation**

Create a PowerPoint presentation of your individual Project with the following slides:

1. The Basics of preparing to integrate sustainability into ICT planning and design projects;

* Perform an audit of the existing ICT environment including its practices and equipment.
* analysing energy audit data on enterprise resource consumption
* Negotiate with the stakeholders to establish the extent to which sustainability is to be integrated
* Research and identify suitable technology solutions applicable to the project
* develop and monitor policies for review and improvements, benchmarking against industry best practice and attempting new approaches continuously over time.

1. ICT sustainability from a business standpoint;

* Investing to integrate sustainability for businesses has become imperative to help drive their competitive advantage by establishing a social status that supports the environment, communities and its own operations. More specifically in case of schools, this will gain the support of their target community and will establish a positive image from their market.
* In addition to improving a business’ social perception from the public, integrating sustainability in ICT will also improve efficiency and ultimately reduce cost within its operations.

1. Energy efficiency as a stepping stone to sustainability;
2. Individual Project Strategy
3. Network operation and security;
4. Sketch of the recommended project system;
5. Test results
6. Short term technology solutions to achieve reduction of power consumption;
7. Energy usage within the ICT project - graph
8. Recommendations and Conclusion.

**Individual Report**

**For your individual project answer the following:**

1. Explain how sustainability can be integrated into your individual Project.

Every modern information based technology runs on electricity.  Electricity use that is based on non-renewable sources such as coal fired plants, creates greenhouse gas emissions.  Greenhouse gas emissions increase global warming and result in issues such as rising sea levels.

Having said that, IT Professionals, Engineers, Integrators and Consultant plays a vital role in the design, selection and utilisation of electronic devices be it energy efficient or not, if only we have a common goal and keep “Sustainability in Mind in all our projects, we will definitely contribute the carbon reduction advocacy.

In summary:

1. Use and promote the use of low power computing devices

2. Use and promote the use of Energy Efficient devices

3. Use and promote renewable energy sources when applicable

4. Use and promote energy monitoring devices.

1. Research and identify suitable technology solutions applicable to the project

Top of Form

### Infrascan solutions by Clipsal

* Long range detection capability and immune to false triggering.
* Surface and flush mount models available.
* Available with integrated lights in outdoor models.
* Override control for manual operation.
* 5-year warranty.

### Energy efficiency benefits

* Energy and cost savings are achieved when lighting is switched on only when required.
* Remembers to turn load off, even when you don’t.
* Enhanced convenience, safety and security.
* Energy savings between 30% and 50% can be achieved.

1. Explain the power consumption data compared to benchmarks

A classroom with 32 fluorescent tubes of 36W each is estimated to have the lights on while unoccupied for

about 10 hours per week. Power consumption including 9W ballast is 45W per tube.

If the school room is used 40 weeks/year:

Energy saved = number of tubes x power x hours x weeks = 32 x 45 x 10 x 40/1000 = 576 kWhs/year

For a tariff of $0.16 per kWh

Cost saving = $92 / year

Ultrasonic sensors can be installed for about $200 if a number of classrooms are wired at one time.

Return on investment = 50% (simple payback of about 2 years)

Daylight-linked controls

A sensor positioned in the ceiling can measure the light levels reflected from surfaces below and

automatically adjust the lighting system to provide an acceptable level of illumination. Suitable only in areas

subject to daylight such as window zones and areas with skylights. Rewiring of lighting may be required.

Some light sensors control on/off switching of the bank of lights along the window side of rooms. Others are

more sophisticated and expensive being able to dim lamps to maintain a pre-programmed light level. To dim

fluorescent lamps, generally electronic ballasts must be installed.

There are several technical issues to consider before installing time switches or sensors. Seek advice from

electrical contractors.

1. Advise how sustainable management principles may be applied to your individual project resulting in reduced environmental impact
2. Provide key performance indicators (KPI) - sustainability performance for your individual Project

**Key Performance Indicators**

|  |  |  |  |
| --- | --- | --- | --- |
| **Hardware** | **SD-KPI 1: Energy / greenhouse gas efficiency of production / products in use**  **(tons CO2)** | **SD-KPI 2: Proportion of products with “Design for Environment” / Eco-Label**  **(√)**  **or (x)** | **SD-KPI 3: Emissions of (hazardous) waste and toxic materials**  **Yes or No** |
| Netbook | 101.4811661 | Yes | Yes |
| Motion sensors | If the school room is used 40 weeks/year:  Energy saved = number of tubes x power x hours x weeks = 32 x 45 x 10 x 40/1000 = 576 kWhs/year |  |  |

1. Advise what actions could improve the KPI’s for your Individual Project which foster sustainability and environmental best practice

Introduce the use of LED lights and upgrading the server to a new more energy efficient hardware.

Plant trees that have specific type of branching to block the heat but still allow the light to pass through.

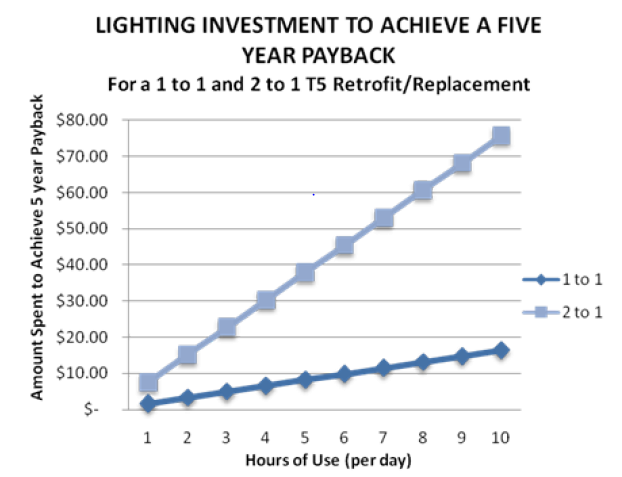
1. Evaluate the estimated CO2 emissions with comparable benchmarks; and
2. Estimate the carbon dioxide (CO2) emissions for the Individual Project; and Individual Project + Recommended Actions

|  |  |  |  |
| --- | --- | --- | --- |
| **Hardware** | **Benchmark**  **(tons CO2)** | **Individual Project**  **(tons CO2)** | **Individual Project**  **+**  **Recommended Actions**  **(tons CO2)** |
| Lighting with motion sensors and CFL | 4549.19 | 4349.19 | 2609.50 |
| Server | .450x24x365x6.89560/10000  = .2711824552 | = .2711824552 | = .2711824552 |
| AND1 | 0.005x262x6.89560/10000  =0.009033236 | =0.009033236 | =0.009033236 |
| Printer | 0.016x24x365x6.8955/10000  =0.096648 | =0.096648 | =0.096648 |
| Monitor | 0.018x24x365x6.89560/10000  =0.108729820 | =0.108729820 | =0.108729820 |

1. Make recommendations in order of priority and give estimates of implementation costs on integration of sustainability for other ICT projects; and
2. Estimate potential energy savings and payback periods for recommended actions

LIGHTING INVESTMENT TO ACHIEVE A 5 YEAR PAYBACK:

The graph below illustrates the feasible amount of money that can be spent on lamps in a classroom to provide a 5 year payback, determined by the number of hours the lights are used a day.



|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Recommendation** | **Priority** | **Implementation Cost** | **Energy Saving** | **Payback Period years** |
| Led lights | 1 | $50 each bulb | 80 % | 1.5 |
| Server infrastructure | 2 | $2000 | 30 % | 2 |
| Tree planting project | 2 | $500 | 10% | 4 |
|  |  |  |  |  |
|  |  |  |  |  |

References:

<http://www.lanier.com.au/files/Lanier%20GXe3350N.pdf>

<http://wiki.eeeuser.com/hardware_power_consumption>

<http://www.clipsal.com.au/consumer/products/lighting/motion_sensors>

<http://www.deloitte.com/assets/Dcom-UnitedStates/Local%20Assets/Documents/IMOs/Corporate%20Responsibility%20and%20Sustainability/us_es_sustainability_exec_survey_060110.pdf>

<http://www.epa.gov/cleanenergy/energy-resources/refs.html>

<http://www.environment.nsw.gov.au/resources/sustainbus/120434EnEffLight.pdf>